

Air Quality Models

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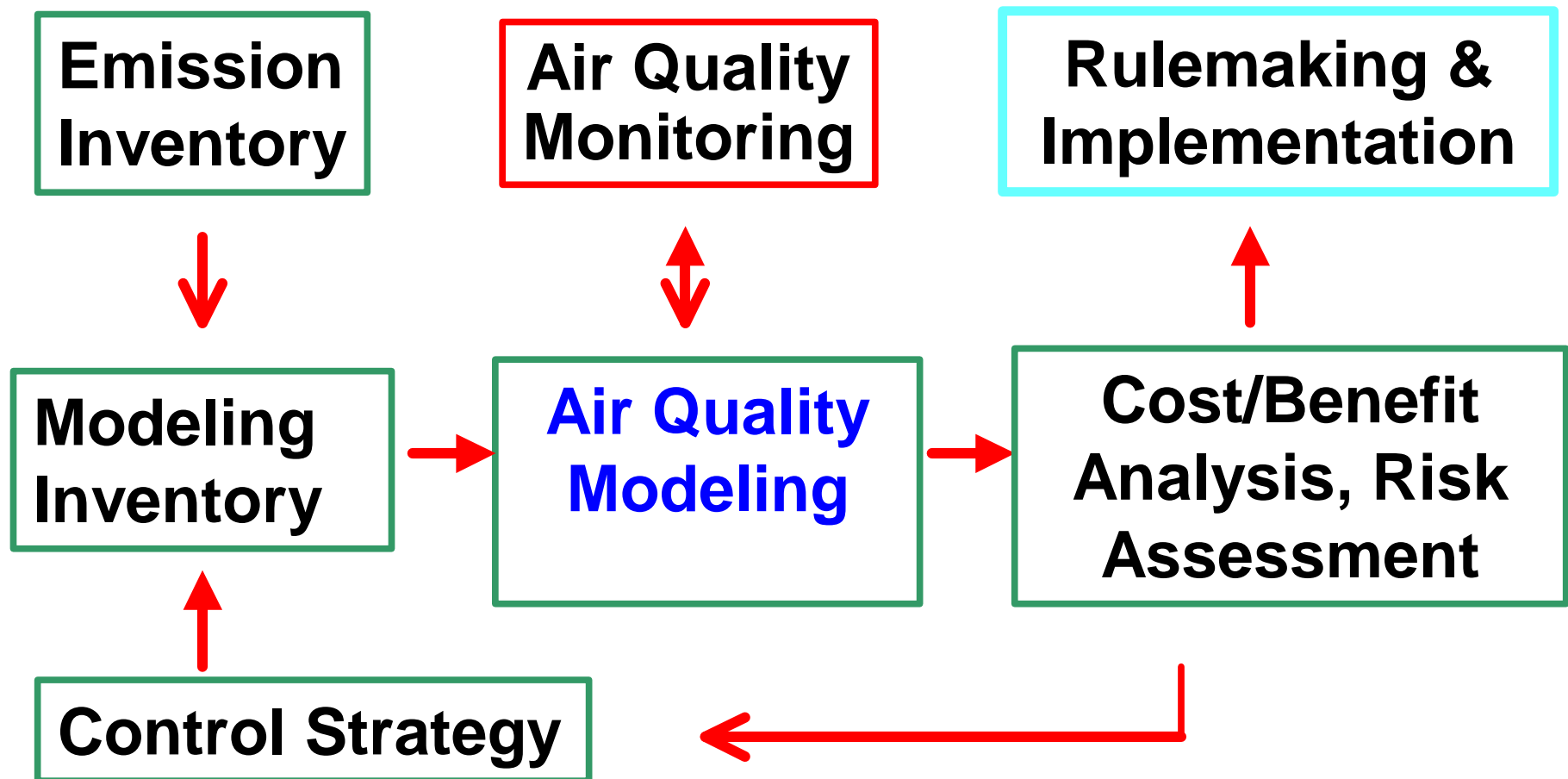
OUTLINE

- **Role of models in air quality management**
- **Describe some EPA models**
- **Example uses**
- **Resources and information**

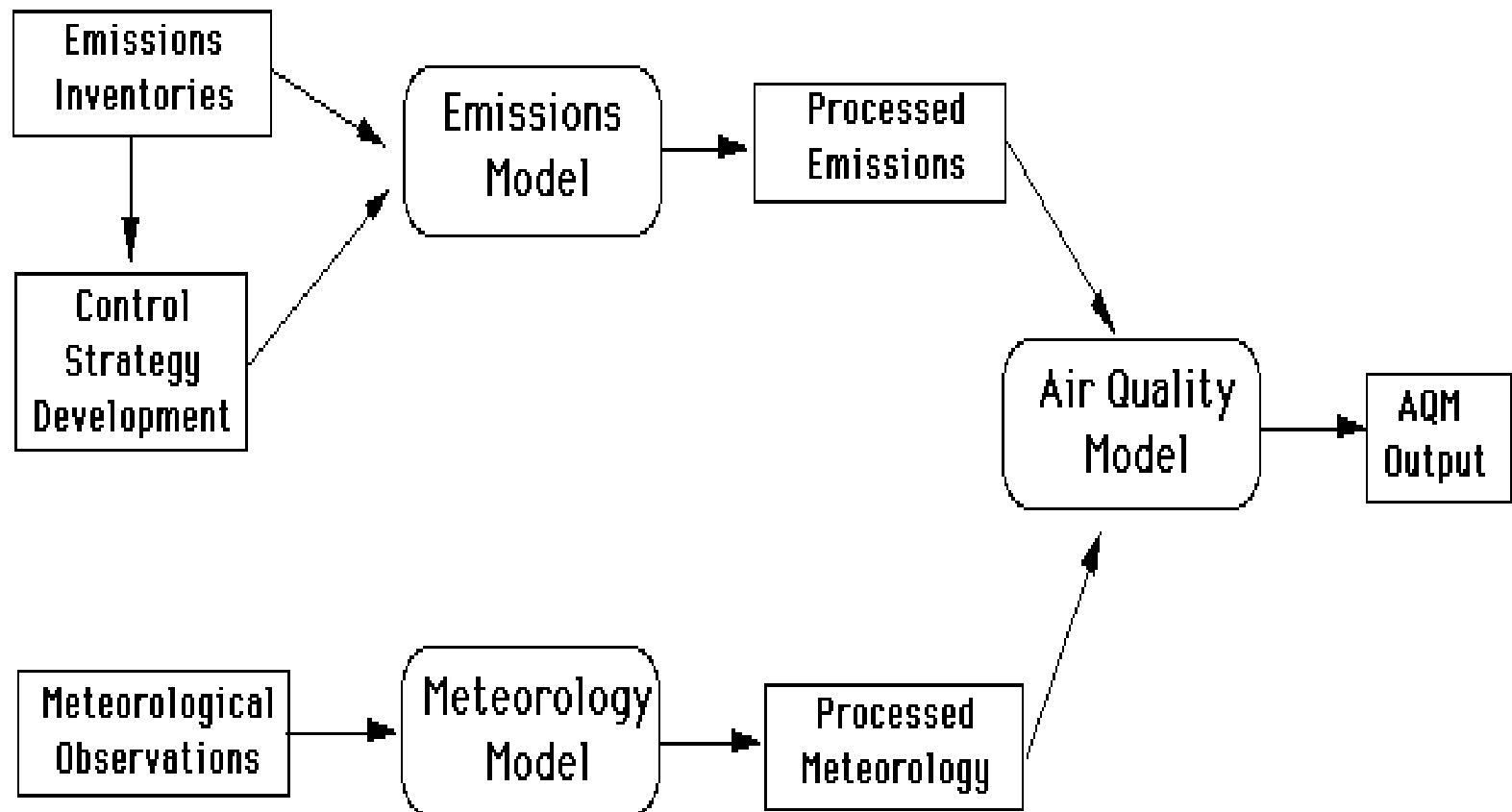
Roles of Air Quality Models

- **Facility permitting**
- **Demonstrate adequacy of emission limits**
- **Policy analysis; project conditions in future years**
- **Help select sites for monitoring**

Role of Air Quality Models in USEPA's AQ Management System



Basic Components of an Air Quality Modeling System



Suitability of Models

- **Meteorological & topographical complexity**
- **Level of detail & accuracy needed**
- **Technical expertise of user**
- **Resources available**
- **Detail & accuracy of data base; Spatial & temporal variations in emissions inventory; Meteorological data; Monitoring data**
- **Air quality models most accurate (least degree of uncertainty) in simulating long-term averages in simple topography**

Types of Air Quality Models

Gaussian

Numerical

Statistical/Empirical

Physical (wind tunnel)

Screening



Refined

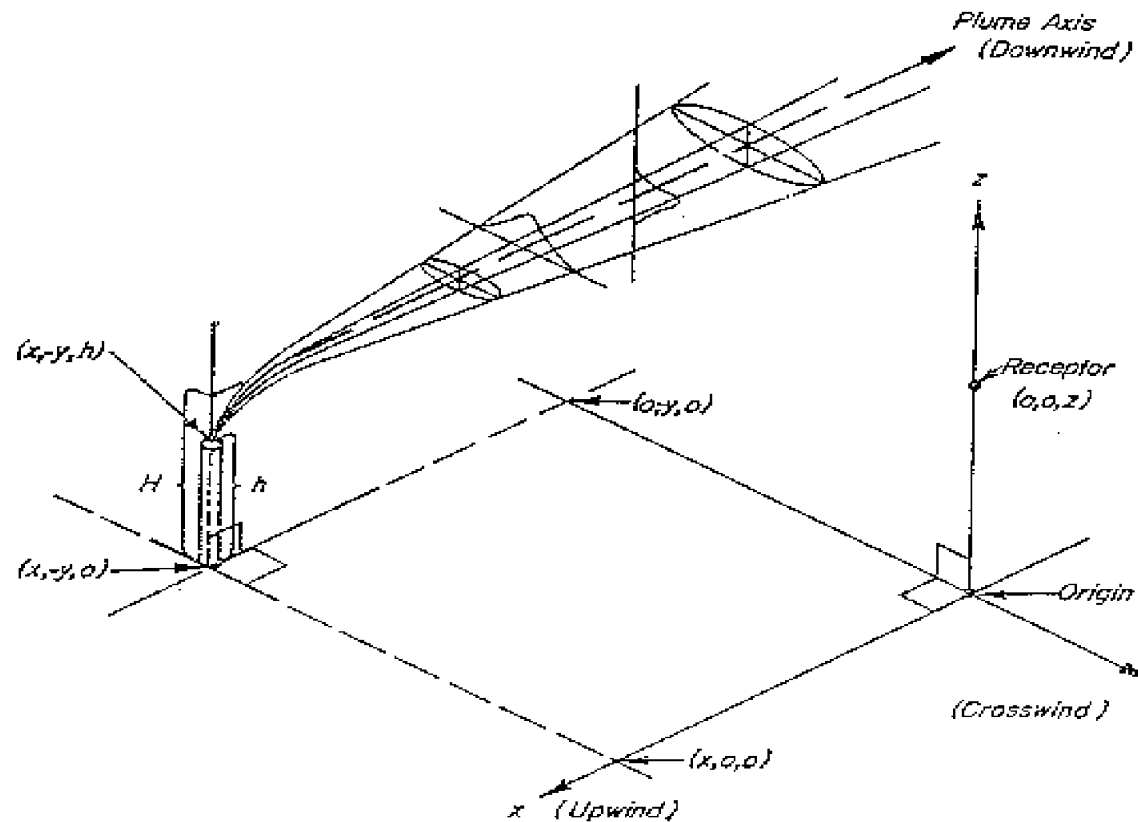
SCREENING Models at EPA

www.epa.gov/ttn/scram (screening tools)

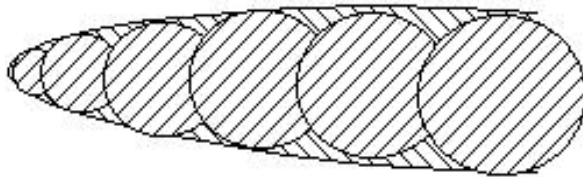
- Most elementary
- Conservative estimate (worst case meteorology) of concentrations
- Single or small groups of sources
- Done prior to refined modeling
- Most common: SCREEN3, TSCREEN

Gaussian Plume Models

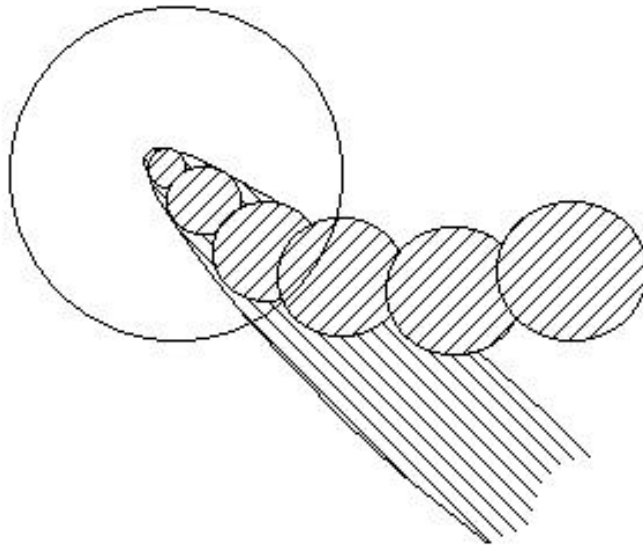
Most widely for used non-reactive pollutants



Gaussian Models

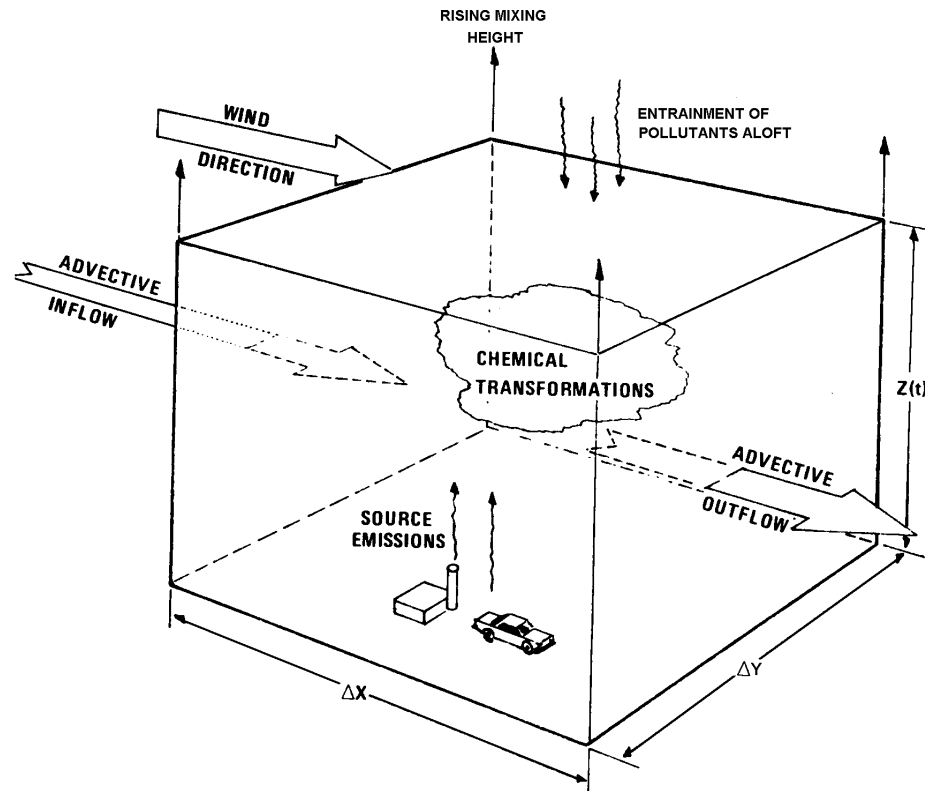


**Steady State Approach:
Plume=Puff**

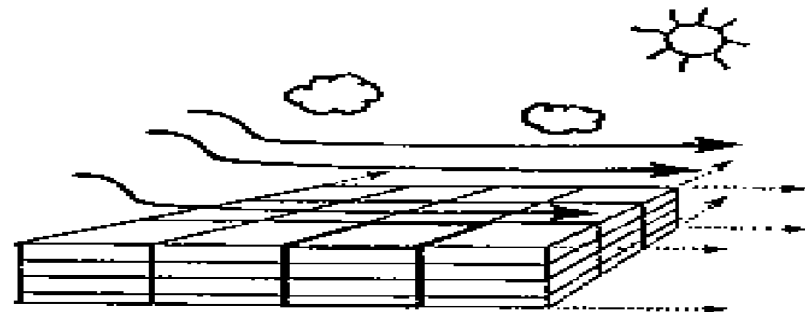


**Non-Steady State
Approach: Puffs follow
the air**

Numerical Grid Models



Reactive Pollutants
Complex Topography



Sources of Air Quality Models

- EPA
 - Many refined models
 - Extensive evaluation (in comparison with monitoring data); Statistical measures of performance
 - Many screening models
 - Model code (executable & source code), documentation (users guides, guidance documents) publically available
- Other Government
 - DOE, DOD, FHWA, NASA, States
- Private Sector
 - Several listed in Guideline on Air Quality Models; little or no charge
 - Others with varying charges
 - Some are EPA models with enhanced user interfaces
- Foreign Countries

Supporting Models/Tools

- **Process meteorological data**
 - EPA models
 - NOAA models
- **Process emissions for input to models**
- **Process terrain data**
- **Process census data**
- **Visualization**

Examples: Policy Analysis

EPA's National-Scale Air Toxics Assessment (NATA) for 1996

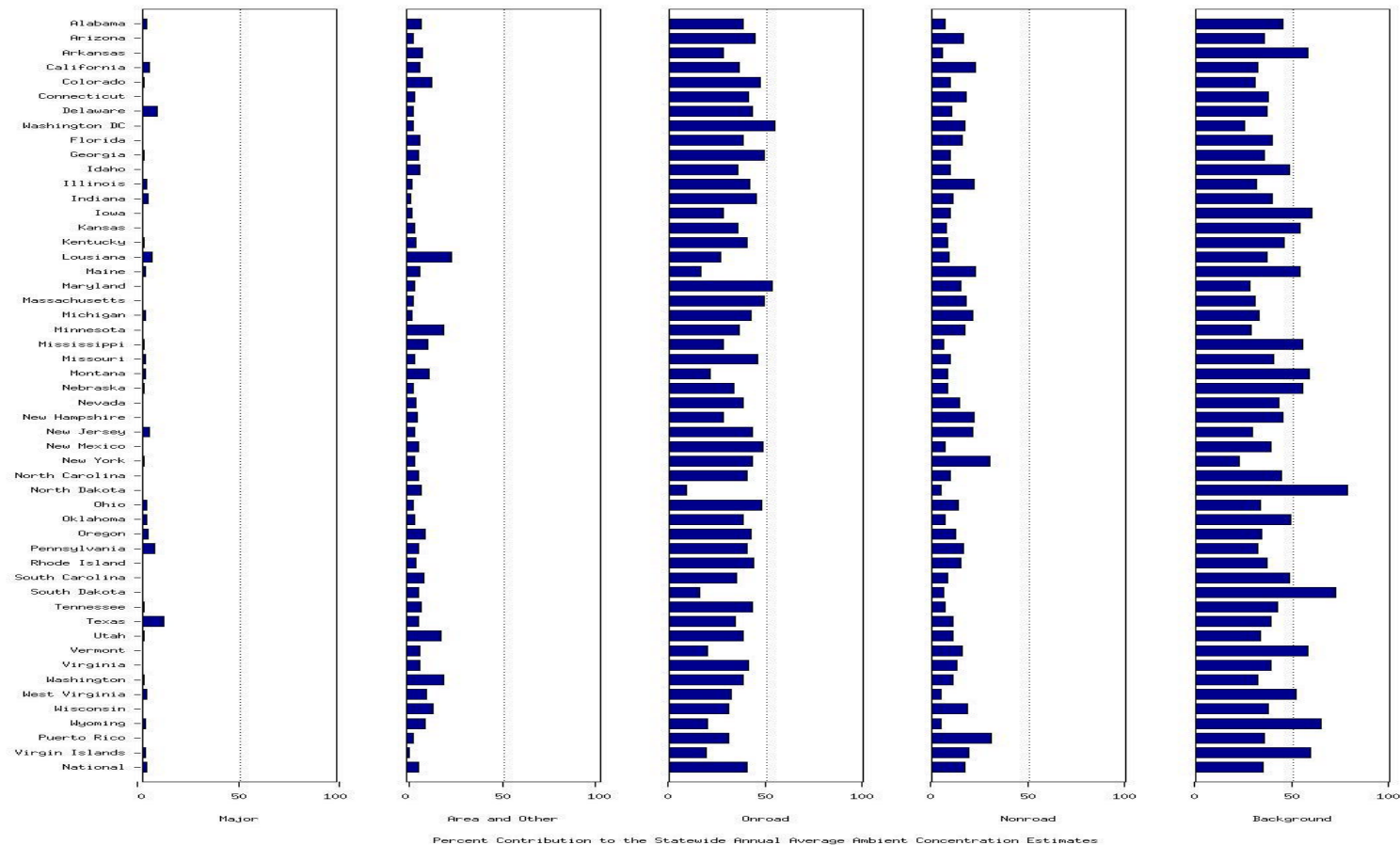
Goal:

Nationwide estimates of inhalation exposure & risk for 32 urban air toxics + diesel PM

Prioritize data (e.g., emissions & ambient monitoring) & research needs

Provide a baseline to help measure future trends

NATA Ambient Concentration Results: Percent Contribution of the State-Wide Annual Average Concentration of Benzene (draft 1996 NTI)



Major

Area &
other

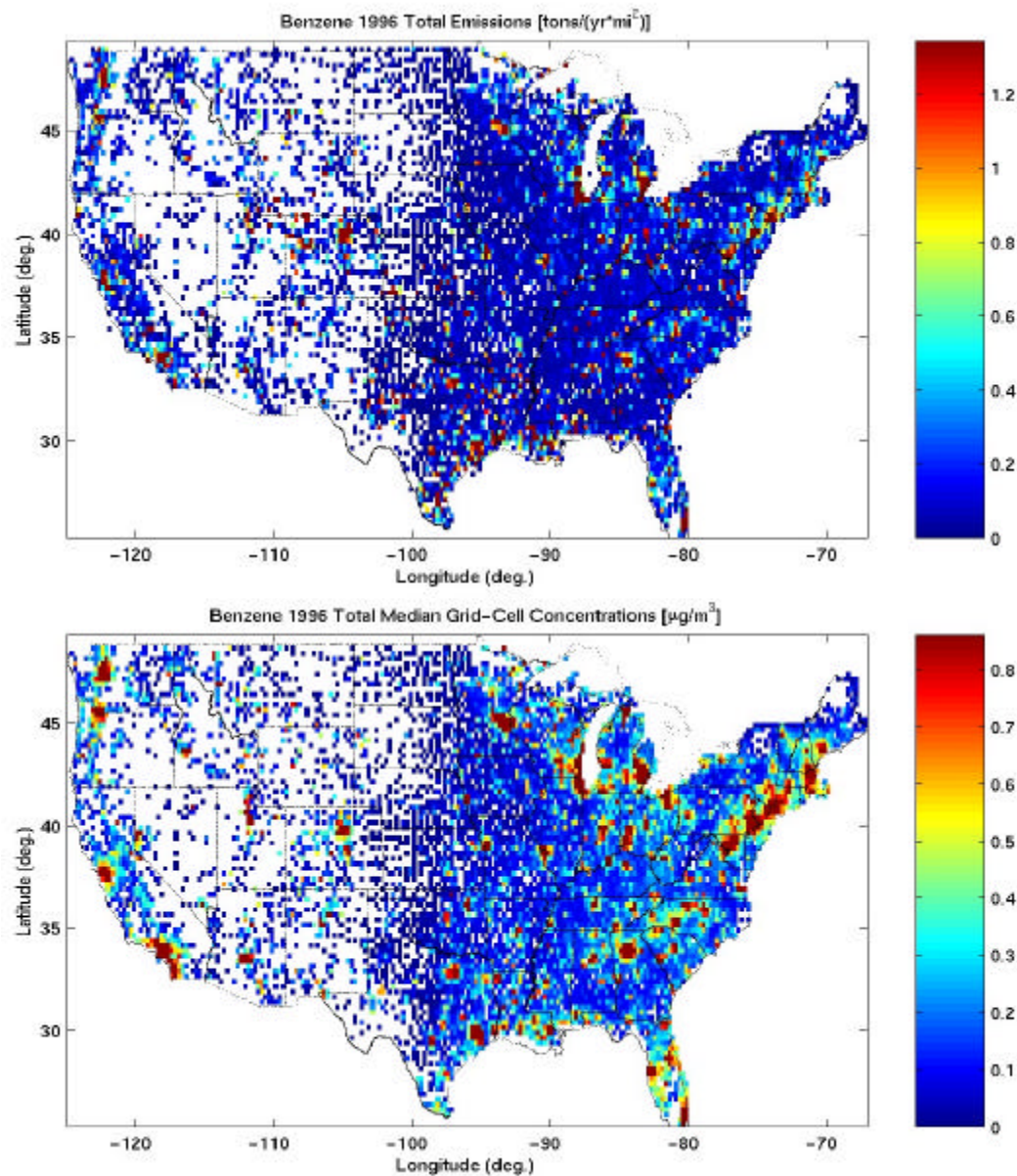
Onroad

Nonroad

Background

Example of AQM application: NATA

Draft 1996 NTI



Resources and Information

- <http://www.epa.gov/ttn/scram>
**SCRAM; (Support Center for
Regulatory Air Models website)**
- **Air Pollution Training Institute**

SCRAM website:

- **Air Quality models, code, user's guides and guidance documents**
- **Appendix W: Guideline on Air Quality Models**
- **7th Modeling Conference: proceedings and proposed rulemaking**
- **Forum & Frequently Asked Questions**
- **Links to other websites (e.g., code developers)**

Air Pollution Training Institute (APTI)

- **<http://www.epa.gov/oar/oaqps/eog/> shows course listings**
- **Classroom courses**
- **On-line courses**
- **Self instructional classes**
- **Workshops/seminars**
- **Satellite courses**

Summary (1)

- **Air quality modeling has a role in air toxics assessments**
- **Different types of models for different situations**
- **Improvements continue to be made**
- **Information is available
(www.epa.gov/ttn/scram)**

Summary (2)

Proficiencies for Air Quality Modeling

- **Meteorological data and processing methods**
- **Emissions data and processing methods**
- **Understanding of modeling:**
 - **Diffusion/transport**
 - **Atmospheric chemistry**
- **Data analysis/statistics (model evaluation)**
- **Working knowledge of computer systems & requirements**